ALIMENTARY TRANSPORT OF POLLEN IN A PARACOLLETINE BEE (HYMENOPTERA: COLLETIDAE)

By Terry F. Houston
Western Australian Museum, Francis Street, Perth, W. Aust. 6000

Abstract

Females of the bee *Leioproctus* (*Euryglossidia*) *?cyanescens* (Cockerell) lack scopae and ingest pollen, carrying it in the crop. Other species of *Euryglossidia* have scopae on the hind legs and carry pollen externally (as is usual amongst Paracolletini).

Introduction

One of the chief characteristics used to distinguish subfamilies of the Colletidae has been the presence or absence of a pollen-holding scopa in females (in this family, a set of branched setae on the hind tibiae and usually also on the hind coxae, trochanters and femora). Females of the subfamilies Colletinae, Diphaglossinae, Stenotritinae and Xeromelissinae have such scopae on which they transport pollen to their nests in a more or less dry state. However, the Hylaeinae and Euryglossinae lack scopae. Their females ingest pollen and transport it, mixed with nectar, in the crop. At the nests, the females regurgitate the food as a semifluid paste.

This paper makes known the atypical habit of an Australian colletine bee (in the tribe Paracolletini) whose females have no scopae and transport pollen internally like Euryglossinae and Hylaeinae.

Identity.– The species concerned is a member of the subgenus *Euryglossidia* Cockerell (in the genus *Leioproctus* Smith), a group of 21 described species badly in need of revision. Michener (1965) gives the most recent account of the group and mentions the degenerate scopa of *L.* (*E.*) *cyanescens* (Cockerell). My specimens agree with the features of *cyanescens* noted by Michener and also with most of the original description given by Cockerell (1929). However, there are small discrepancies and the name *cyanescens* is used here tentatively pending revision of the subgenus. All specimens mentioned here are in the Western Australian Museum.

Observations

Specimens were first collected by the author on September 7th 1979, 30 km north of Bullfinch in south-western Australia; three males and five females were taken on flowers of *Acacia aciphylla* and *Thryptomene tuberculata*. Absence of the usual tibial scopae and pollen loads of females was noticed: nowhere on the hind legs or body were there sufficient plumose setae to carry adequate pollen loads. Absence of the scopa in some other groups of bees (e.g. *Thyreus, Inguilina* and *Coelioxys*) is associated with parasitic habits but, to date, no reports of parasitic habits in the family Colletidae have been verified. The species was next encountered on October 9th-14th 1979 at Emu Rock, 53 km east of Hyden, W.A. Females were

abundant at flowers of *Muehlenbeckia adpressa* and occasional on flowers of *Acacia ligulata*. Dozens of females were closely inspected but none had any obvious pollen load. However, those on *Acacia* flowers could be clearly seen obtaining pollen: with jaws held wide apart, they walked through the stamens and raked the anthers towards the mouth. Several females collected at the flowers were dissected and proved to have crops distended with pollen. There can be no doubt that this species gathers pollen and transports it internally.

At least nine other species of *Euryglossidia* are represented in the collection of the Western Australian Museum and females of all of them have at least sparse tibial scopae composed of plumose setae. The hind coxae, trochanters and femora, and the metasomal sterna also bear branched setae. One or more females of each species has conspicuous pollen loads on these setae. There is marked variation amongst species in the degree of development of the scopa. As Michener (1965) noted, compared with other Paracolletini, *Euryglossidia* typically have a sparse scopa, but one relatively large unidentified species in the Western Australian Museum has quite a dense scopa of highly plumose setae extending over most of the hind legs and metasomal sterna. Apart from this species and *cyanescens*, all of the *Euryglossidia* specimens for which I have plant data have been collected at flowers of *Hakea* and *Grevillea*. Microscopic examination reveals that the pollen of these plants is relatively coarse and the sparse scopae of the bees are presumably adapted to holding the large grains.

Discussion

The evidence presented above indicates that females of *L. cyanescens* gather pollen for nest provisioning and are not parasitic as their lack of scopae might suggest.

It is generally considered that the most primitive bees had scopae and thus the absence of scopae is a derived condition. If the Hylaeinae and Euryglossinae represent independent losses of scopae (as I believe is probable) then *L. cyanescens* represents the third known change from scopal to alimentary transport of pollen.

Alimentary transport of pollen must bring with it certain advantages: females are saved the effort of manipulating pollen onto the scopa at flowers and off the scopa in the nests and combining nectar with it to form the larval provisions. However, it is most unlikely that such a change could occur without some preliminary changes in the bees' environment to act as a catalyst. As previously noted, many species of *Euryglossidia* have sparse scopae seemingly correlated with their preference for *Grevillea* and *Hakea* pollen. Thorp (1979) gives evidence of an inverse relationship between scopal density and size of pollen grains carried by other groups of bees. Thus, *Euryglossidia* with sparse scopae are probably ill-equipped to carry fine-grained pollen externally and, should their usual food plants become unavailable, their survival would depend on utilising coarse-grained pollen from other

plants or developing a new means of transporting finer-grained pollens. Perhaps the ancestor of *cyanescens* was a *Grevillea*- or *Hakea*-specialist that faced this problem and overcame it by the latter means. *L. cyanescens* has been observed to feed at flowers of three unrelated families (Myrtaceae, Mimosaceae and Polygonaceae) and is thus clearly a polylectic species. Its habit of ingesting pollen means that grain size is not a limiting factor in its choice of food plants.

Acknowledgements

Identifications of food plants were provided by Mr N. S. Lander, Western Australian Herbarium, Department of Agriculture, Perth.

References

Cockerell, T. D. A., 1929. Bees in the Australian Museum collection. *Rec. Aust. Mus.* 17: 199-243.

Michener, C. D., 1965. A classification of the bees of the Australian and South Pacific regions. *Bull. Am. Mus. nat. Hist.* 130: 1-362.

Thorp, R. W., 1979. Structural, behavioural, and physiological adaptations of bees (Apoidea) for collecting pollen. *Ann. Mo. bot. Gdn* 66: 788-812.

AN ACCUMULATIVE BIBLIOGRAPHY OF AUSTRALIAN ENTOMOLOGY

Compiled by M. S. Moulds

BANKS, H. J.

1980. Identification of stored product *Cryptolestes* spp. (Coleoptera: Cucujidae): a rapid technique for preparation of suitable mounts. *J. Aust. ent. Soc.* 18(3): 217-222, 1 table, text-figs 1-12.

EDGAR, J. A., BOPPRE, M. and SCHNEIDER, D.

1980. Pyrrolizidine alkaloid storage in African and Australian danaid butterflies. *Experientia* 35: 1447-1448.

ETMAN, Ahmed A. M. and HOOPER, G. H. S.

1980. Developmental and reproductive biology of *Spodoptera litura* (F.) (Lepidoptera: Noctuidae). *J. Aust. ent. Soc.* 18(4): 363-372, 1 table, text-figs 1-4.

EVENHUIS, Neal

1980. Studies in Pacific Bombyliidae (Diptera). V. Notes on the *Comptosia* group of the Australian region, with key to genera and descriptions of a new genus and three new species. *Pacific Ins.* 21(4): 328-334, text-figs 1-7.

FARRELL, G. S. and NEW, T. R.

1980. Some aspects of the biology of the eucalypt-mining sawfly *Phylacteophaga froggatti* Riek (Hymenoptera: Pergidae). *Aust. J. Zool.* 28(1): 83-90, tables 1 & 2, text-figs 1-10.

FIELD, R. P., WEBSTER, W. J. and MORRIS, D. S.

1980. Mass rearing *Typhlodromus occidentalis* Nesbitt (Acarina: Phytoseiidae) for release in orchards. *J. Aust. ent. Soc.* 18(3): 213-215, 1 table, text-fig. 1.

GRIFFITH, I. P., SMITH, A. M. and WILLIAMSON, W. E. P.

1980. Raising potato moth larvae [*Phthorimaea operculella* (Zeller): Lepidoptera: Gelechiidae] in isolation. *J. Aust. ent. Soc.* 18(4): 348, 1 table.

LACHLAN, Robert

1978. A record of *Vagrans egista* (Lepidoptera: Nymphalidae) from Torres Strait islands, northern Queensland. *Aust. ent. Mag.* 5(1): 10.